

Studies on Variability for Sample Size Determination in Measuring Various Characters of Sugarcane

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ABSTRACT

Variabilities within the ancillary characters like height, weight, diameter, number of internodes, brix and pol of sugarcane were studied to determine the number of sampling units to be selected per experimental plot. So that the average of each character for the sample size can fairly represent the average yield of the plot. In this respect, investigation was undertaken, data were collected and statistically analysed.

The results showed that two canes from each of four randomly selected rows were found to be the best for studying height, diameter and number of internodes. All plants harvested from four randomly selected rows produced representative statistic for weight. For studying brix and pol, samples of at least ten canes at random per plot was found to be ideal.

INTRODUCTION

In the field of research, it is possible to collect data on the variables like weight, number of millable canes, number of tillers and germination percentage through complete harvesting or counts of an experimental plot but there are some variables like height, diameter and number of internodes on which data for each stalk of the plot is not possible to enumerate. Same is the case for brix and pol of cane. Sometimes it is necessary to harvest crops of a lot of experiments consisting of numerous plots within a short period. For sugarcane research one has to take sample of stalks from each plot of an experiment and then data on height, weight, diameter and number of internodes of each of the sampled cane are also to be recorded including the brix and pol of a cluster of sample. Hence it is a pre-requisite to determine the number of sampling units for a plot so that the data on above parameters are reliable. Such types of studies to estimate the sample size on crops like cotton, wheat, barley and linseed were carried out by Panse (1938) and on sugarcane by Legendre *et. al.* (1969) and Patil *et. al.* (1980). Since there was no such work on sugarcane in Bangladesh, the work was conducted to find out the representative sample size for the above parameters following the procedure of Yates and Zaccagnini (1935).

MATERIALS AND METHODS

In order to study the effect of various sizes of sample for each character, data were recorded from a field experiment conducted at the sugarcane research and Training institute farm during 1983-84. The experiment was a replicated trial having 6 plots per block. The plot size was 10m x 10m. Each plot contains 10 rows of canes. Strict randomization was followed for unbiased estimate of each trait and for their valid estimate of sampling errors. To ensure randomness, total canes in each row were counted and recorded separately. These figures (cane nos.) were used to consult table of random number to select the sample for collection. It was decided to consider the entire row as the sampling unit for weight and single cane stalk as the sampling unit for other characters. The desired rows in each plot of the blocks were harvested and weight were recorded separately.

For data on brix and pol two plots were selected. Then 16 canes from each row of each plot were taken randomly. These 16 canes were grouped randomly into 8 bundles of two canes. Thus from 10 rows of each plot 10 groups of 8 bundles were made. One bundle from each group were taken to crush separately and brix and pol of juice were recorded from each. This process was repeated and separately accumulated to the previous juice from where brix and pol were recorded after every crushing. This process was continued till all the 16 canes of each row were exhausted. Thus data on brix and pol were obtained for 2 canes, 4 canes, 6 canes, 8 canes, 10 canes, 12 canes, 14 canes and 16 canes. Each had 10 records. The method for analysis was followed as described by Yates and Zaccopani (1935).

RESULTS AND DISCUSSION

The variability of each sample size was expressed in terms of coefficient of variation (sampling error as % of mean). For height of cane the coefficient of variation (Table 1) fluctuated with sizes of samples accumulation.

Table 1. Height of cane.

		Number of rows					
		2	3	4	6	8	10
Number of sample/row	Sample mean (m)	2.58	2.56	2.55	2.58	2.58	2.57
	Plot error as % of mean	10.53	10.40	10.35	9.10	8.54	8.57
	Sampling error as % of mean	14.80	15.11	14.70	14.96	14.81	15.73
2							
3	Do	2.53	2.50	2.49	2.53	2.53	2.52
		10.45	9.77	9.30	7.52	6.99	7.36
		16.75	17.99	17.30	17.54	17.17	17.93
4	Do	2.71	2.67	2.66	2.67	2.69	2.67
		8.16	7.74	6.94	5.95	5.30	5.40
		21.65	22.43	22.00	21.02	20.69	21.45

For diameter of cane the c. v. was 4.96 for 2 row and 9.46 for 10 rows with a depression with 4 rows (Table 2).

The c. v. for number of internodes was 17.07 for 2 rows of 2 canes each and 16.75 for 10 rows with depression with 4 rows (Table 3).

Similar trend was found in case of weight (Table 4).

The c. v. increases as the number of sample (cane stalk) increases from 2 rows for any character except for diameter where number of rows after 4 did not show the same trend. So it is evident from the results that the c. v. was found to be minimum for 4 rows of 2 canes each which

Table 2. Diameter of cane.

Number of sample /row		Number of rows					
		2	3	4	6	8	10
2	Sample mean (cm)	2.22	2.22	2.22	2.22	2.22	2.23
	Plot error as % of mean	3.76	4.84	4.62	4.42	3.82	3.14
	sampling error as % of mean	9.96	8.93	8.37	9.15	9.21	9.46
3	Do	2.20	2.20	2.20	2.21	2.21	2.22
		2.84	3.31	3.31	3.30	3.29	2.98
		10.37	9.96	9.17	7.88	8.50	8.93
4	Do	2.22	2.22	2.22	2.23	2.24	2.24
		2.81	2.95	2.77	2.76	2.57	2.48
		13.37	12.26	11.39	9.96	10.03	10.23

Table 3. Number of internodes.

Number of sample/row		Number of rows					
		2	3	4	6	8	10
2	Sample mean	22	22	22	23	23	23
	Plot error as % of mean	9.14	8.62	7.13	6.18	4.85	5.90
	Sampling error as % of mean.	17.07	17.02	16.04	16.05	16.39	15.75
3	Do	22	23	23	22	22	22
		9.61	8.39	7.55	5.79	4.43	5.50
		18.32	19.06	18.24	18.11	17.95	18.61
4	Do	23	22	22	23	23	23
		8.80	7.16	6.02	6.19	3.45	4.01
		19.47	20.29	19.71	19.40	19.05	20.11

Table 4. Weight of cane.

	Number of rows					
	2	3	4	6	8	10
Sample mean (kg)	91.76	91.74	92.05	91.78	91.30	91.63
Sampling error as % of mean	7.62	7.99	7.54	7.38	5.94	6.56
Plot error as % of mean	12.04	10.80	9.72	9.79	10.27	10.63

provided information to the sample selector to select from an experimental plot firstly 4 rows then 2 canes from each row for the characters height, diameter, number of internodes and complete harvest of 4 rows for yield (weight). In case of diameter of cane, though the c. v. 7.88 for 6 rows of 3 canes each was found to be very low this variation was considered to be unexpected. Apart from this, sample size of 18 canes/plot for diameter is considered to be higher and impractical.

The c. v. for brix and pol (Table 5) decreases as the number of sampled cane stalk increases from 2 canes to 10 canes i. e. c. v. 7.94 and 10.18 for brix and pol decrease to 3.39 and 4.21, then remain constant as the sample size increased from 10 onwards.

Table 5. Figures in coefficient of variation on Brix and Pol percent.

Number of cane stalk sampled	Brix (%)	Pol (%)
2	7.94	10.18
4	4.74	7.49
6	4.67	5.99
8	4.82	6.21
10	3.39	4.21
12	3.27	4.23
14	3.08	4.09
16	3.15	4.21

So the minimum sample size for brix and pol percent is considered to be atleast 10 canes. This size of sample may give an estimate for brix and pol percent adequately representing the brix and pol of the entire plot.

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